



CASE STUDY

METABOLIC HEALTH, EXERCISE & WEIGHT LOSS

OVERVIEW

Metabolism is defined as the set of biochemical processes which exist inside all living organisms in order to maintain life. When compromised, it can lead to a range of common disorders which now affect 1 in 2 Australians such as obesity, fatty liver and diabetes.

Evidence suggests that exercise alone is a relatively inefficient means for losing weight, however plays a key role in weight loss maintenance¹ and can improve metabolic health through insulin sensitivity and enzyme changes as seen in this case study.



Exercise Physiologist:
Kiley Green

Client Name: Bill*

Age: 27*

REFERRAL & PATIENT HISTORY

Bill* is a 27-year-old with a history of metabolic issues including insulin resistance and fatty liver disease. He began his journey with Metabolic Health Solutions (MHS) in 2015 at 153.2kg, seeking to increase his energy and concentration levels and improve his overall health profile. From the end of June 2015 to the end of March 2018, Bill had successfully lost 16.5kg, of which, 10.4kg was from fat and only 4.2kg was from muscle. His progress occurred mainly in the first 6 months and was attributed to long term dietary changes and increased physical activity levels based on his case history and metabolic profile.

By March 2018, Bill's current weight was 136.7kg and had a weight loss plateau which persisted for approximately a year and a half. The client was partaking in three sessions of HIIT (High Intensity Interval Training) per week and a consistent LCHF (low carb high fat) diet.

SHORT TERM GOALS

1. Overcome recent plateau in weight loss
2. Maintain or improve muscle mass





INTERVENTION

ASSESSMENT

Before changing his training regimen, the client undertook indirect calorimetry testing with ECAL, anthropometric assessment of waist and hip, body composition testing with DF50, and pathology testing to assist in determining the best action plan to overcome plateau and validate interventions given. ***See results in table below*

PROGRAM DESIGN

The program was designed to target the whole body and bigger torque producing muscles. Strength protocols were utilised based on case history and estimated 1RM values. This method is most accurate with repetitions closer to 1 and become less accurate as the number increases.

1RM TESTING

Testing was done in a gym setting with a spotter. The weights were chosen based on previous experience of the client as well as tester expertise. The estimated 1RM values were limited by the client's technique and his minimal experience with resistance training.

RESISTANCE TRAINING

Each week, there was one session of upper body and one session of lower body muscle groups. Both sessions begun with a 5 minute warm up and 10 – 15 minutes of HIIT. ***See programs below*

PROGRESSION

The program progressed first by increasing repetitions and then weight, based on client perception of difficulty and professional expertise. At 8 weeks, estimated 1RM was re-tested due to drastic technique and strength improvements.

SELF-MANAGEMENT

The program provided the client with the skills necessary to undertake resistance training by himself. Technique and weight choice was explained to the client in depth throughout the program.

SUPPLEMENTATION

The client begun taking vitamin D supplements to reduce his vitamin D deficiency and Milk Thistle to help improve his liver function in March 2018.



RESISTANCE PROGRAM

WEEK 1: 55-60% 1RM						
	EXERCISE	REST - EXERCISES	REST - SETS	SETS	REPS	WEIGHT
SESSION 1	Barbell Deadlift	2-3 mins	30 secs	3	10	40kg
	Barbell Squat	2-3 mins	30 secs	3	10	20kg
	Dumbbell Reverse Lunges	2-3 mins	30 secs	3	10	2 x 8kg
	Dumbbell Step Ups: Big Box	2-3 mins	30 secs	3	10	2 x 10kg
	Medicine Ball Squat pulse	2-3 mins	30 secs	3	20s	10kg
	Plank	2-3 mins	30 secs	2	20s	0kg
SESSION 2	Dumbbell Triceps Extension	2-3 mins	30 secs	3	10	10kg
	Dumbbell Bicep Curl	2-3 mins	30 secs	3	10	2 x 9kg
	Reverse Fly	2-3 mins	30 secs	3	8	TBC
	Bench Press	2-3 mins	30 secs	3	10	2 x 15kg
	Shoulder Press	2-3 mins	30 secs	3	10	2 x 7kg
	Upright Row	2-3 mins	30 secs	3	10	20kg
HIIT Training		5 min warm up. 10 mins: 10 x 20:10 - 4 x 40:20. 5 min cool down				

WEEK 6: 55-65% NEW 1RM VALUE

	EXERCISE	REST - EXERCISES	REST - SETS	SETS	REPS	WEIGHT
SESSION 1	Dumbbell Forward Lunges	1-2 mins	30 secs	3	14	2 x 15kg
	Dumbbell Step Ups: Big Box	1-2 mins	30 secs	3	10	2 x 17.5kg
	Barbell Deadlift	1-2 mins	30 secs	3	12	65kg
	Barbell Squat	1-2 mins	30 secs	3	12	60kg
	Leg Press Machine	1-2 mins	30 secs	3	8	160kg
	Glute Thrusts	1-2 mins	30 secs	3	10	30kg
SESSION 2	Shoulder Press	1-2 mins	30 secs	3	10	2 x 12.5kg
	Upright Row	1-2 mins	30 secs	3	12	30kg
	Unilateral Bent Over Row	1-2 mins	30 secs	3	10ea	15kg
	Bench Press	1-2 mins	30 secs	3	10	2 x 20kg
	Dumbbell Triceps Extension	1-2 mins	30 secs	3	8-10	15kg
	Dumbbell Bicep Curl	1-2 mins	30 secs	3	12ea	2 x 12.5kg
	Bicycle Crunch + Plank	1-2 mins	30 secs	2	20-30	BW
HIIT Training		5 min warm up. 10 mins: 10 x 25:10 - 4 x 35:20. 5 min cool down				


OBJECTIVE MEASURES

MEASUREMENT	INITIAL: JUNE 2015	PRE-RESISTANCE TRAINING MARCH 2018	3 MONTH POINT JULY 2018	RANGE
Resting Energy Production (REP) (kcal)	2655	2176	2228	N/A
Energy Generated from Fat (%)	62	90	100	48 - 83
Energy Generated from Glucose (%)	38	10	0	17 - 52
Oxygen/Energy Efficiency (%)	14.91	14.71	14.59	<17
Weight (Kg)	153.2	136.7	128.2	N/A
Waist (cm)	144*	133*	127*	F <80, M <94
Hips (cm)	132	126	125	N/A
Body Fat (%)	39.2	36.5	35.4	8 - 20
Body Fat (Kg)	59.8	49.4	45.3	N/A
Active Tissue Mass (%)	35.1	36.6	37.8	N/A
Active Tissue Mass (Kg)	3.7	49.5	48.4	N/A
Vitamin D (9mmol/L)	N/A	30*	63	20 - 50: Deficient <20: Severely Deficient
Liver Function: Gamma GT (U/L)	185*	201*	107*	5 - 50
ALT (U/L)	39	60*	41*	5 - 40
Insulin	N/A	14*	8	2 - 12
C-Reactive Protein (mg/L)	N/A	4*	2.4	<3.0



DISCUSSION AND RESULTS

The resistance training successfully assisted Bill in overcoming his plateau in weight loss. Three months after the commencement of resistance specific exercise intervention, the client lost 4.1kg of fat and only 1.1kg of muscle. He also significantly improved his liver function, insulin and vitamin D levels confirmed with pathology, and reduced his weight to 128.2kg.

Bill reported prominent visual differences in his muscle tone and size as well as skeletal structures since beginning resistance training. In addition, he has noticed major improvements in his overall fitness levels in high intensity interval training and drastic improvement in his strength. Bill reported confidence doing resistance training on his own and increasing or decreasing weights as necessary



CONSIDERATIONS

1. 1RM calculation limitations.
2. Supplementation and resistance training both begun at similar time.



REFERENCES

- 1) Bensimhon, D.R., Kraus W.E. & Donahue M.P.(2006). Obesity and physical activity: a review. American Heart Journal, 151(3), 598-603.
- 2) Calculate Your One-Rep Max (1RM) [Internet]. Bodybuilding.com. 2018 [cited 11 July 2018]. Available from: <https://www.bodybuilding.com/fun/other7.htm>

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